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The present invention concerns an optical disc and a method to their production.

In Fig. a conventional method for the production of optical discs is as for instance shown 3 from image plates. In accordance with this method first a photoresist layer 2 becomes exhibiting photoresist collecting main, which is evenly distributed on the major surface of a glass sheet 1, as in Fig. 3 (A) shown, prepared, afterwards toward the photoresist layer 2 a laser beam  $\lambda_0$  is directed, which is switched on for a given in accordance with signal intermittent, in order on the photoresist layer 2 a stored image in form of a spiral or concentric formed set of points, which correspond to given information, to produce. Then those is developed belich photoresist collecting main, in order to create on it a set of very small Eintiefungen (in the following as ?pits? the referred become), which correspond to the signal which can be noted, so that a developed photoresist collecting main results, which exhibits the photoresist layer 2 (information recording layer), provided with the pits, and the glass sheet 1, as in Fig. 3 (b) shown is. Then the photoresist layer 2 on this developed photoresist collecting main with the goal of their adjustment on the glass sheet 1 (nachgebrannt), so that a dried photoresist collecting main arises, as in Fig is dried. 3 (C) shown is. Subsequently, the photoresist layer 2 with a metal as for instance silver or nickel is vaporized, in order to form on it a conductive film 3, from which an original 3a of the photoresist collecting main with a laminating structure results, like it in Fig. 3 (D) shown is. It means that the pits exhibiting information recording surface is made by the vaporization of the photoresist layer with a ME conductive. Subsequently, the received nut/mother photoresist collecting main is immersed in a nickel Galvano Formungsbad to apply u on the conducting film 3 by means of electroplating nickel (never) in order to create a thick nickel layer 4 or a nickel temple, whereby a plate will receive, like it in Fig. 3 (e) shown is. Subsequently, the stamp or the nickel layer 4 is separated from the glass sheet 1, as in Fig. 3 (f) shown is. The photoresist layer 2 and the conducting film 3, which remain on the stamp, thereupon eliminated, whereby a nickel temple is created, as it in Fig. 3 (g) shown is. Then the nickel temple is attached and clamped at a given position of a jet moulding machine. Further into the nickel temple a translucent resin material is squirted as for instance melted and free-flowing PMMA (polymethyl metacrylate) or PC (polycarbonate), whereby the resin material is removed after its hardening, in order to create an impression of the optical disc with a given information recording surface.

On in this way received impression a reflecting film is separated as for instance an aluminium film using well-known methods, covered afterwards the reflecting film mi a protective film, whereby the optical disc will receive. Generally two in this way produced optical discs together-pasted and a finishing process are subjected, so that a double-sided optical disc results.

With this conventional method however on the one hand many Galvanoformungsschritte are necessary, until the stamp is finished, so that for the event of the electroplating much time is necessary; on the other hand for the production of the impression a relatively large jet moulding machine is needed. Since the production of the stamp takes much time in principle and is expensive, the conventional method for the production is suitable by several optical discs, which fulfill the present tendency to the production of many different types of audiovisual software in small in each case number of items, not optimal.

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It is therefore the object of the present invention to create an optical disc and a method to their production whereby the optical disc for the production of many different types by optical discs in small in each case number of items and for the mass production of optical discs is to be suitable by means of relatively simple processes.

This object with a method of the genericin accordance with-eaten kind in accordance with a first aspect of the present invention solved by the features in the characterizing portion of the claim 1.

Furthermore this object with an optical disc of the genericin accordance with-eaten kind solved according to invention by the features in the characterizing portion of the claim 2.

Finally the object with a method of the genericin accordance with-eaten kind in accordance with a further aspect of the present invention solved by the features in the characterizing portion of the claim 3.

According to invention the number of the production steps for the optical disc can be reduced, in addition the life of the optical disc can become elongated.

Furthermore the time necessary for the production of a stamp can be shortened according to invention, whereby the manufacturing process for the optical disc is simplified.

The invention is more near described in the following on the basis preferential embodiments with reference to the designs; show:

Fig. 1 a schematic cross section of the elements in the individual steps of a manufacturing process for an optical disc in accordance with a first embodiment of the present invention;

Fig. 2 a schematic cross section of the elements in the individual steps of a manufacturing process for an optical disc in accordance with a second embodiment of the present invention; and

Fig. 3 a schematic cross section of the elements in the individual steps of a conventional manufacturing process for an optical disc.

In the manufacturing process in accordance with the first embodiment first by means of a spin-coating procedure or such a thing a photoresist collecting main is created, which exhibits a photoresist layer 20, which is evenly trained on the main side of a cleaned, transparent substrate 10 from glass, PMMA, PC or such a thing. As in Fig. 1 (A) shown, toward the photoresist layer 20 a laser beam La is directed, which is switched on for a given in accordance with signal intermittent, in order on the photoresist layer 20 a stored image in a spiral or concentric set of points, to which correspond to the given information, to produce. The photoresist layer 20 covers a resin, an photo-sensitive material and a ballast connection, whose composition is further below described.

Subsequently, the exposed photoresist collecting main is developed, in order to create on this a set from very small Einliefungen to, which correspond to the signal which can be noted; thus a developed photoresist collecting main is received, which exhibits the photoresist layer 20 (information recording layer), provided with pits, and the transparent substrate 10, as in Fig. 1 (A) is shown.

The photoresist layer 20 on this developed photoresist collecting main is warmed up and dried with the goal of its adjustment on the transparent substrate 10 (nachgebrannt), whereby a dried photoresist collecting main arises, as in Fig. 1 (C) is shown.

Then the photoresist layer 20 is illuminated with ultraviolet jets, as in Fig. 1 (D) shown, in order to accelerate the crosslinking of the resin in the photoresist layer 20, so that the photoresist layer is hardened as information recording surface.

Subsequently, on the row of very small pits is trained the exhibiting information recording surface a reflecting film 30 from aluminum or such a thing, as in Fig. 1 (E) is shown, whereupon this reflecting film 30 is covered with a protective film, whereby an optical disc will receive.

The manufacturing process for an optical disc in accordance with this first embodiment of the present invention is identical up to the step of the Nachbrennens to the conventional method. An essential feature according to invention of this embodiment umfasst the embodiment of the step of accelerating interlacing the photoresist layer 20 after the step of the Nachbrennens.

The disk structure serves more exactly in accordance with this first embodiment, which the reflecting film enclosure, which is trained on the photoresist layer exhibiting the pits, with the production of one or several optical discs as such an optical disc. It is necessary to suppress the degradation of the photoresist layer 20 dependent on the time and to prevent the corrosion of the reflecting film by the photoresist layer. In addition the crosslinking of the photoresist layer 20 is accelerated, in order to stabilize this photoresist layer 20 more rapid, so that the simultaneous taking place corrosion of the reflecting film is suppressed.

In the state of the art was tried to use the disk structure, which exhibits pits an exhibiting and photoresist layer 20 covered with a reflecting film, directly as optical disc. The optical disc resulting in it knew however its capability characteristics due to the degradation of the Photolackschicht and the reflecting film connected closely with the photoresist layer not over is enough oneself for time period maintained. With the method according to invention in accordance with the first embodiment kônnen both these disadvantages and the above-mentioned problems of the state of the art concerning the time-consuming production process and the many production steps to be eliminated. The optical disc received by the method in accordance with this embodiment does not need stamp during the entire production process for the production of an impression, so that it receives a faithful information recording surface.

As described above, the production steps can be simplified with the manufacturing process for an optical disc in accordance with the first embodiment of the present invention, so that this method for the production is suitable by optical discs in small number of items; therefore the problem of various types of audiovisual software is controllable in small in each case number of items with this method according to invention. The optical disc according to invention can receive an information recording surface to also correctly formed pits.

Now the second embodiment of the present invention is described. With the production of one or several optical discs a method can be used, with which the pattern of the very small pits de Mutterphotoresistvorlage serving as information recording surface is provided using a resin temple and not a metal stamp transferred will and on the basis this resin temple an impression. This casting manufacturing process is a so-called 2P-Verfahren (photo polymer method), with which (2P? mentioned) a photo polymer fluid is used, which is a resin hardening by ultraviolet jets, with which the information recording surface is covered, whereby the layer is illuminated in accordance with this method afterwards with ultraviolet beams, over the 2P to harden and afterwards the hardened 2P as transmission layer for the information recording surface is used. During the transmission of the information recording surface, which serves the creation of an impression using the 2P-Verfahrens, a barrier layer must be trained as for instance a metallic film, in order to prevent a corrosion of the photoresist by the 2P-Material on the surface of the photoresist layer of the nut/mother photoresist collecting main. The formation of the barrier layer can entail the following three problems (1) to (3), which can be eliminated however by the method in accordance with the second embodiment of the available Erfindu.

- 1) The formation of the metallic film is difficult and time-consuming.
- 2) Since the barrier layer on the pits trained in the photoresist layer is planned, those are changed forming of the pits on the transmission surface, which entails a degradation of the reproduction of the signals from the optical disc received by means of the resin temple from an impression.
- 3) Since the cover cover becomes taken out of a pure space atmosphere and following arranged in a steam separation machine, dust can adhere at the cover, which can entail dropouts.

Now the manufacturing process for an optical disc is described in accordance with the second embodiment of the present

invention, with which the above-mentioned problems can be eliminated.

First on the main side of a cleaned, translucent plate 100 from glass, which serves the photoresist collecting main as substrate, is trained evenly a photoresist layer 200, whereby a spin-coating procedure or such a thing is used and the photoresist collecting main is created. As in Fig. 2 (A) shown, the photoresist layer 200 is illuminated with a laser beam La, which is switched on in accordance with a given signal intermittent which can be noted, so that on the photoresist layer 200 a stored image is trained in form of spiraliformer or concentric series of points, which correspond to the given information. The photoresist layer 200 covers a resin, an photo-sensitive material and a ballast connection, whose composition is further below described.

Subsequently, the exposed photoresist collecting main is developed, whereby on this a set of very small Eintiefungen, which correspond to the signal which can be noted, is created, from which a developed photoresist collecting main results, which contains the photoresist layer 200 (information recording layer), provided with pits, and the translucent plate 100, as in Fig. 2 (b) shown is.

Subsequently, the photoresist layer 200 is warmed up on this developed original and dried with the goal of its adjustment on the translucent slice 100 (nachgebrannt), whereby a dried photoresist collecting main will receive, as in Fig. 2 (C) shown is.

Subsequently, toward the photoresist layer 200 ultraviolet beams are directed, as in Fig. is shown 2 (D), in order to accelerate the crosslinking of the resin in the photoresist layer 200, so that the photoresist layer serving as information recording surface hardens, whereby a nut/mother photoresist collecting main results. Finally the very small pits exhibiting information recording surface is covered with a 2P-Fluid, which is a resin hardening by means of ultraviolet beams, whereupon toward in such a way covered information recording surface ultraviolet beams are directed, in order to harden 2P fluid to a transmission layer 400 of the information recording surface, as in Fig. 2 (e) shown is. This transmission layer 400 can become on a suitable stamp retaining plate maintained. For this purpose the transmission layer 400 between the developed photoresist collecting main and (not shown) a stamp retaining plate, which are planned in the upper range of the representation, can be trained.

Then the transmission layer 400 is separated from the developed original, as in Fig. 2 (f) shown is. That is, that the transmission layer 400 represents a resin temple.

Up to the step of the Nachbrennen the manufacturing process for an optical disc is identical in accordance with the second embodiment of the present invention to the conventional method. Egg essential feature of this second embodiment covers the creation of the step of accelerating the crosslinking of the photoresist layer 200 after the step of the Nachbrennen.

In accordance with the second embodiment with the production one or several optical discs the crosslinking of the photoresist layer is accelerated more exactly, in order to increase the resistance opposite the 2P-Mater, in order to carry out so a 2P-Übertragung on the photoresist layer, without a barrier layer must be planned.

As described above, the manufacturing steps can be simplified with the manufacturing process for an optical disc in accordance with the second embodiment of the present invention, whereby a faithful transmission of the information recording surface in the production process of the optical disc is obtained, so that this method for the production is suitable by optical discs in small number of items; therefore the production of various types of audiovisual software is beherschbar in small in each case number of items with this method.

Preferably the photoresist layer of the manufacturing process for optical discs covers in accordance with first and the second embodiment in the following the indicated components (1) to (3).

(1) Resin component (base polymer): Preferably the resin essentially covers cresol novolac, which is given to 1 by the following chemical formula. (2) Photo-sensitive material: Preferably the photo-sensitive material covers mainly the ester, which is formed from 1,2-Naphthochinon Diazo-5-Sulfonchlorid, whereby this chloride is given to 2 by the following chemical formula and by a ballast connection, which is represented to that by one far formulas 3 to 15 or by a mixture of the same, indicated down. (3) Ballast connection: Preferably the ballast connection is represented by one of the following formulas 3 to 15 and added in a quantity from 3 to 9 weight % relative to the entire photoresist.

EMI11.1

EMI12.1

By ultraviolet beams ( $\text{hv}$ -induced) photo reaction of the photo-sensitive material of the photoresist induced as for instance Naphthochinon Diazo, which is represented by the formula 2, runs off according to the chemical formula 16 indicated down. Concerning the acceleration of the crosslinking it can be stated that during a direct heating up (burns) of the easy interlaceable Indenketen or effectively crosslinked during effect of light (ultraviolet jets) on the Indenketen in an anhydrous condition the base polymer becomes by this Indenketen. In particular in case of cresol novolac, which represents the main component of the base polymer of the existing positive photoresist, the acceleration of its crosslinking finally creates a sturdy warm-hardening bakelite (Kresolformalinharz). The ballast connection makes it possible to add to its OH-groups an photo-sensitive material whereby bringing a large quantity of photo-sensitive material into the resist is ensured. Thus the cross-linking degree with the base polymer can be increased.